AMERICAN ELECTRO-PLATERS SOCIETY

(An Educational Society)

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MONTHLY REVIEW

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INDEX

	Page
Editorial Staff	2
Editorial	3
By Jos. Birbaum	3
By B. E. Miller	5
By Samuel R. Taylor	7
By O. C. Easton	9
By Robt. Suman	10
By O. J. Sizelove	11
By Oscar E. Servis	15
What the Branches are Doing	19
News Notes	23
By H. J. Richards	24

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Yet I doubt not through the ages
One increasing purpose runs
And the thoughts of men are widened
With the process of the suns.
(Tennyson)

MONTHLY REVIEW

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Vol. 3 MARCH No. 3

EDITORIALS

HE WHO TEACHES LEARNS.

By Jos. Birbaum, Milwaukee.

The lottery of life brings us at times in contact with queer bedfellows whose thoughts don't seem to widen any more than a leopard will change his spots nor darken his skin, whose mind is loaded with as many selfish ideas as a long-haired dog is full of fleas.

A few days ago it occurred that I ran across one of this kind. My first impression was of having the pleasure to get acquainted with a Master of our Profession, but alas, "Sic transit gloria mundi." Here was a greater man. He didn't have to be a member of the A. E. S. He is not fool enough to show them what he knows and they can't show him nothing.

It seems almost impossible that men should live in the present who belong to the junk heap of the past. We of the A. E. S. live, work and learn also in the present, but we try to improve the present with a view to have simpler and better methods in the future.

Any intelligible plater knows, that only through close co-operation are we able to accomplish great deeds, that only through co-operation and interchange of new methods, discoveries and inventions are we able to progress, not only to benefit ourselves, nay! also to the benefaction of modern industries and all mankind.

With the founding of the A. E. S., the foundation was laid for a great beacon, a lighthouse, and the name of this beacon is "The A. E. S. Monthly Review," and the crew which is manning it is our editorial staff, but as is the case of the gunner to whom must be brought the ammunition that he may be effective at his post, so it is with the lighthouse keepers to whom must be brought the fuel that the light may never cease to send its beams of help to the plater in distress who finds rough going on the sea of his daily work routine and sends out a S. O. S. call to be led out of the fog of a wrong undertaking, and you each and every individual member are the ones who ought to co-operate and bring your share of fuel towards this beacon light of the Electro-Plating Industry. Co-operating means a joint effort, by merely joining the A. E. S. I concede you are at least

making a start to overcome some of the old stupid ideas as are existing in the cranium of the ninth wonder "Plater" whom I had the questionable pleasure to meet, but you are not co-operating, you are only combining with a body of well meaning men if you hold a Membership Card only.

How about those plating solutions of yours wherein are combined associated, gold and silver or copper to produce either green or roman gold, copper, zinc or tin for brass or bronze, all these metals were combined, associated with their proper solvents and conducting salts, but what if one or the other of the metals in their respective baths should fail to do their assigned part in the plating process, what if the zinc should fail to properly co-operate with the copper to produce the desired shade of brass, all ingredients are combined, still you're having a plating bath in name only.

Associations alone won't do. Co-operate! Let's hear of your woes, troubles, dreary days and failures in your experiments to improve our craft. Also relate your joyous moments with what methods and formulas you are most successful. Somewhere in this continent are platers who *need your* advice, somewhere are platers who can *give you* advice.

Among the advance guards of modern industry, we can recognize platers of the A. E. S. who are determined to capture the forts of Perfection and Success. To capture these twin forts, a deep and general knowledge of the electroplating process and their chemicals is necessary, besides, a clear, fairminded, business-like administration of your department.

Don't fall asleep at your post after capturing these forts, but develop yourself further. Years of service in one particular line tend to make you more efficient, an expert. If perchance another plater drops into your line, and asks for a few pointers, give him such pointers, not in a "Who am I" spirit, but brotherly. Remember he might be more proficient in a different metal.

Quid docet, discit: He who teaches learns.

Of what use is the sunlight to man if his mind is in the dark? Therefore, kindle and nurse that candle of knowledge of yours, no matter how weak it may glimmer or how strong it may be burning. Do not seek to hide it under a bushel; do not hesitate to set this candle of knowledge in the open for fear that a gust of criticism might arise and extinguish the flame. Be not afraid to come in the open if you have new methods, different ways and ideas. Let a cyclone of criticism arise; it will not succeed to extinguish the flame if you are right, but if you are wrong, and this new scheme of yours proves to be a fallacy, if the least gust of criticism should extinguish the flame, nurse not ill feeling in your heart, remember no one else but yourself will be the biggest gainer.

We were delighted to receive a letter from Florida, written by our Supreme President, and still more pleased to learn from Mr. Barrowes that he has returned to health. We even strained our credulity in endeavoring to believe that fish story, but without success.—Ed.

CALCIUM CHLORIDE IN NICKEL SOLUTIONS.

By B. E. MILLER, Secretary Detroit Branch.

Calcium chloride was used about forty years ago by H. P. Dechert and N. S. Keth of New York City. Their methods were, however, different from mine.

The crude calcium chloride is a by-product of salt brine which is pumped out of the earth. This chloride has a larger percentage of calcium with a small percentage of magnesium and contains less than ¼ of 1 per cent impurities. This chloride is manufactured by the Saginaw Chemical Works, Saginaw, Mich. I have tried other makes but find that the Saginaw chemical works the best.

In the use of calcium chloride it is necessary for a plater to have a tank 4 to 6 inches deeper than his work; for this reason, after the addition of calcium chloride in the nickel solution there is found a precipitate, white in color, which settles to the bottom of the tank. This precipitate must remain at the bottom of tank in order to get the desired results. You will find your work will plate in fifteen minutes where it took an hour before, using calcium chloride.

This solution should stand over night after being made. On the following morning you will find a very thick scum on the top of solution, which should be skimmed off. This you will find every morning for a few days or a week; upon allowing this scum to dry you will find that it looks like tissue paper pulp.

What this scum is and why it should form on top of the solution is for a chemist to determine.

After running this solution for four months it will be necessary to take this precipitate out of the tank and renew the calcium chloride. It apparently loses its power of conductivity in about four months, and you will notice that the deposit of nickel is going on slower. After this precipitate is in the tank about two months you will find it has changed to a rusty looking color which is due to the iron in the solution.

In renewing calcium chloride in the solution I have used from 2 to 4 ounces to the gallon and I would recommend using 2 ounces at least—the more calcium chloride you put into the solution the more precipitate you will have at the bottom of your tank. This solution should be stirred up every couple of days to get the best results.

Upon close examination you will find after three weeks of daily use that your anodes are giving up their metal very freely. I do not claim, however, as some firms which sell the so-called nickel high speed salts, that you don't have to use nickel salts after you once make up your solution, but I will say owing to loss of solution through the drip in taking out the work, it will be necessary to make additions of single nickel salts from time to time.

The nickel is soft and malleable and can be plated on steel and formed afterwards without peeling off. Brass and copper work can be cleaned and put into the tank without the use of the cyanide dip as the nickel solution will remove all tarnish or stain from work in a few seconds; in two minutes a coat of nickel can

be plated which will stand color buffing. The higher the finish you have on your work before plating, the brighter it will be when plated, therefore the less energy it takes to buff the nickel which is a saving in material and labor.

Commercial aluminum can be plated in this solution without the least trouble and I have plated the pure sheet aluminum in this solution, but with difficulty, as sheet aluminum is so light it had to be weighted down in order to get sufficient contact. The piece that I did plate stood hard buffing, but upon bending to a sharp bend the nickel peeled away about one-eighth of an inch. This I consider a very hard test for nickel upon aluminum. I do not claim it would be practical to plate on sheet aluminum in this solution, but I believe through more experimenting it can be done.

In making test upon cast iron and steel I took pieces which I plated fifteen minutes in the calcium chloride solution and pieces which were plated one hour in a solution without the chloride, laid these pieces outside where the rain and snow could cover them whenever we had a storm and I hung pieces over the hot water tank where the steam could come in contact. In these tests made, the pieces which I plated fifteen minutes stood the better test, so it goes to show that calcium chloride in a nickel solution will not cause castings to rust faster than any other nickel solution.

Formula for 10-gallon solution:

7½ lbs. Double Nickel Salts.
2½ lbs. Single Nickel Salts.
2½ lbs. Boracic Acid.
1¼ lbs. Calcium Chloride.

Calcium chloride can be bought for 3 to 5c per pound, which depends upon the quantity you wish to get. A great many refrigeratory plants use this chemical for making ice, also for the purpose of cinderizing roads.

This ten gallon solution I worked for several months before changing my 500 gallon solution over by the addition of calcium chloride. I have now been using for about one year and six months. I have tried to plate in this solution after taking out the precipitate, but found that the work had to remain in the solution for one hour to get the desired thickness.

It is said that sal ammoniac will give the same results, but I have not found it so, as I have done a great deal of experimenting along those lines. By the use of sal ammoniac I never found a precipitate in the bottom of tank like that which is found in the use of calcium chloride, therefore I claim that it is this precipitate which lays at the bottom of tank that has a power of conductivity which gives the desired results—fast plating.

If any chemist who reads this article can tell me why this heavy scum comes to the top of solution upon making or renewing with calcium chloride it would be interesting to me. I would say that it is due to the impurities in calcium chloride, but I am not positive, so I will have to leave it for the chemist to determine.

NICKEL SOLUTIONS.

By SAMUEL R. TAYLOR, Newark Branch.

Nickel solutions are commonly used with the present day electro-platers. On the troubles which come with nickel bath very few platers agree. This much we all agree to, that our acid solution will cause a more or less bright and brittle deposit and an alkaline solution will cause a dark and soft deposit. As to pitting in a nickel solution, it is generally agreed that pitting is usually due to a deficiency of metal. Others will say that it is due to too high a current and others will say it is often due to floating impurities which settle on the work. Probably they are all correct to some extent, but my experience has been that it is due to a deficiency of metal. The correction for this truth is to add the single salts, if the solution be alkaline in reaction, and carbonate of nickel of the solution be deficient in metal and shows an acid reaction. The single salts may be purchased white. It is comparatively easy to prepare the carbonate of nickel. This may be prepared by precipitating nickel sulphate with carbonate of soda, using the same method as in preparing carbonate of copper.

As it is our intention to take up nickel solution quite thoroughly, we will go to the A, B, C of plating. What caused a nickel solution to become deficient in metal? I think it is safe to say that an insufficient anode surface or a larger cathode surface than anode surface is one of the causes. This will naturally take the nickel from the bath in a larger ratio than the anode supplies the metal, causing a deficiency in metal and an excessive acidity in the solution. It is quite well known the anodes in a nickel solution are never, or very seldom, 100 per cent efficient! That is to say that the anodes do not supply the metal as fast as it is taken from the solution. An anode which is not as efficient as others will aggravate this trouble and the usual remedy is to add salts every once in a while, usually the double salts.

Another cause for acidity is improper rinsing of the work after pickeling, thus carrying some of the acid which remains in or on the work into the bath, causing excessive acidity. The same is due to improper using when carrying the work from the potash tank. This, however, will cause excessive alkalinity. I have always found it best to have a dilute hydrochloric acid dip, 1 part acid to 9 parts water, which will neutralize the alkalin in the cleaning and then rinse carefully in clean water before placing in the bath.

The ordinary nickel bath for brass, copper, iron, steel and German silver work is composed of 12 oz. of the double salt or nickel-ammonium sulphate to the gallon, which is very nearly its saturation point in regards to double salts. This solution will stand around 7 or 8 Beaume. Various conducting salts are added to the solution in order to increase its efficiency, the most common being sodium chloride or common table salt, ammonium chloride or sal ammoniac and magnesium sulphate is coming prominently into use with the present day platers. Other salts and acids are added for certain purposes, such as: Boracic acid, ammonium hydroxide or aqua ammonia and sulphuric acid. The advantages and disadvantages of these reagents will be taken up at a later time.

Regarding conducting salts, ammonium chloride or sal ammoniac is considered the best, as it has the highest conducting powers. Sodium chloride comes next, but it has not the same power of conducting as sal ammoniac. Magnesium sulphate is very commonly used by the present day platers, but the disadvantages of magnesium sulphate or Epsom salts, as it is commonly used, is that it seems to impart to the nickel deposit a yellowish tinge.

Boracic acid, a white crystalline salt, is sparingly soluble in cold water but very much more soluble in hot water. It is first dissolved in hot water and then added to nickel solution. Boracic acid is very commonly used on all classes of work, as it imparts to the nickel deposit a fine white color. Various amounts are used, usually from ½ to 4 or 5 ounces per gallon.

Various parties have tried using other nickel salts besides that of the single and double sulphate salts, but their use is uncommon. The best results are usually had from either the single or double sulphates. Good results are to be had from solutions containing either single salts alone or double salts alone. A formula commonly used by the present day platers contains 8 ounces double salts, 2 ounces single salts, 1 to 2 ounces boracic acid and 1 gallon water. This solution and the solutions containing the double salts along with some conducting salts are usually used on all metal with the exception of zinc. When depositing nickel directly upon steel and iron it is best to have the solution slightly acid.

A solution recommended for depositing on zinc contains nickel sulphate (single salts), 10½ ounces; potassium citrate, 17 ounces; ammonium chloride, 10½ ounces; water, 1 gallon. A large amount of trouble has been experienced in nickel plating zinc articles. If the article has not been previously heavily copper or brass plated there has often been black and dark streaks resulted. Very often after a large amount of zinc has been plated the solution will turn dark, probably due to some of the zinc having been absorbed. I have often gotten the best results by forcing the nickel on for a few minutes and then cutting down the current to normal. There seems to be a general impression in the minds of the present day platers that chloride, either sodium or ammonium, should be kept out of nickel solution. Further discussion on this point is desired.

In articles which have been previously nickel plated it is a usual thing to either remove all the nickel or to copper plate over the nickel. It has been found by Professor Snoudin of Cornell University, that by using a 20 per cent solution of hydrochloric acid and a carbon anode with reverse current that the oxide found can be reduced and the nickel plated directly upon nickel. I have used this to good advantage as it only requires a few seconds' immersion. Some years ago when I first started plating I found that it could also be applied to black nickel. During the immersion the black nickel would change to the beautiful blue or purple which is so much desired. This purple was also very staple, the opposite produced by the hypo and lead acetate solution. If some of you platers will experiment with that perhaps something new can be added to our art.

SHERARDIZING.

By O. C. Easton, Cleveland Branch.

While sherardizing is not directly in line with the electro-deposition of metals, it is well that the platers be familiar, to some extent at least, with all methods of depositing one metal on another. As platers we are continually called upon to produce finishes that are not entirely of an electrolytic nature—sherardizing is one of these.

It has long been known that if an article of copper were buried in the ground in certain localities and fires were allowed to burn for a time, the copper piece took on lighter shades. This was due to the zinc in the soil. This was the first principle of the process that we now know as sherardizing.

It seems that sherardizing was discovered by accident. While sone English scientists were trying experiments on hardening steel in the laboratory of Sherard Cowper Cowles, an English metallurgist of London, one of the experiments was placing some pieces of steel in an iron box with zinc dust and placing it in their hardening furnace to see if it would have any hardening effect on the steel. Upon the removal of the box from the furnace it was discovered that the steel was coated with zinc, and on closer examination with the microscope, chemically, etc., it was found the zinc had penetrated the other metal and formed an alloy with it. This is very plainly visible to the eye. when copper is sherardized. Now of course we all know that brass is an alloy of copper and zinc, so if a piece of copper is sherardized and afterwards polished through the zinc you will observe a good substantial coating of brass; now if the polishing is still continued you will come to the copper. This shows very plainly how the zinc combines with the metal that is sherardized. This, of course, is not as visible where iron or steel is sherardized, due to the fact that the two metals are so near the same color.

There have been a great many theories as to why the zinc is deposited on and alloyed with the metal treated, but I think that the theory of sublineation is possibly the one most correct. Of course we are aware that zinc can be reduced to a vapor by heat. Now what takes place when steel or other metals are placed in an iron receptacle with zinc dust and heated. The first thing is the reducing of the zinc to a gas which is absorbed by a metal, and on cooling is reduced to a metallic deposit. The thickness of the deposit can be controlled by three factors: time, temperature and strength of dust.

Most any metal can be sherardized, but of course it is usually applied to steel or iron as a rust preventative. It is, when properly done, the greatest of all methods for the prevention of rust known at the present time. The fact that it forms an alloy with the other metal in addition to the coating on the outside, makes it very different in character to the other two methods that are used so extensively; that is, dip-galvanizing and electro-galvanizing.

Of course each has its place; some articles cannot be sherardized as cheaply as electro-galvanized and still other articles look better if they are dip-galvanized.

In the process of sherardizing, the articles are first, cleaned about the same as we would for plating, except when they are ready for sherardizing treatment they are thoroughly dried before they are placed in the dust. The material, such as small castings, stampings, etc., are usually placed in steel drums about four or five feet long and 16 or 18 inches in diameter. These are placed on cars and rolled in the ovens, which are preferably heated with gas. The temperature is then raised to 700 or 800 degrees F. and held at this temperature for five or six hours and sometimes longer, depending upon the class and nature of material in the run.

After the work has been run for the required length of time, the drums are rolled out, allowed to cool and the material screened out from the dust. It is then ready for shipment.

Long or large pieces are sherardized in about the same way as the small, except they are placed in a large steel box car, instead of a drum; all heats or runs are tested to see that the required amount of zinc has been deposited; this is usually done by running test pieces of the same kind of material. These are afterwards tested by the methods most satisfactory to the customer; if they do not specify a test we usually use copper sulphate test, which I think is as reliable as any when it is properly done, although it is very misleading if it is not. This same test can be used of course for any process of galvanizing. Some claim it should not be used on sherardizing, on account of the alloy line, but if it is properly done there is absolutely no doubt about its being reliable, although some prefer the acetate of lead, caustic potash, or soda, salt water, salt spray, electrolytic, weight method, etc.

SEDIMENT IN ACID DIPS.

ROBT. SUMAN, Dayton, Ohio.

Can the sediment in the bottom of crocks, which are used for dipping or pickling copper or brass, be recovered to advantage? These are now mostly thrown away. The acids used are sulphuric, nitric and muriatic. Could these sulphates, chlorides or nitrates be saved, or the metal extracted chemically or electrically? What is this sediment called chemically, and can it be separated to a profit? It can be sent to the refineries, but this will hardly pay for the time and expense incurred. There is in some places a little, and in other plants a considerable quantity thrown away every year. It certainly contains considerable metal. Can this metal be extracted by some means and leave a profit?

Mr. Suman asks a question of considerable interest here. I would ask some member or members who have knowledge on this subject to answer it.—Ed.

THE TRAMP AND THE EDITOR.

Devil—"There's a tramp at the door, Mr. Hyde, and he says he ain't had nothin' to eat for six days."

Editor—"Fetch him in. If we can find how he does it, we can run the paper for another week."

NICKEL.

By O. J. Sizelove, Newark Branch.

Pure nickel is a lustrous silver white metal with a slight still gray tinge. Its specific gravity varies from 8.3 (cast nickel) to 9.3 rolled nickel. Valence 2 and 3. Atomic weight 58.68.

The metal is soluble in dilute nitric acid, very slightly so in concentrated nitric acid. In hydrochloric and sulphuric acid it dissolves slowly.

When applied to purposes for which it is especially adapted, nickel plating may be considered one of the most important branches of the art of electro-deposition. While practical experience has taught us what to avoid in connection with nickel plating it has also shown how vast is the field of usefulness to which it can be applied.

Its value as a covering for other metals is due to the brilliant luster obtained by polishing and to its durability in contact with the atmosphere, while its hardness renders it little liable to injury from ordinary usage.

Although as early as 1842 Professor Boettger, a German chemist, succeeded in obtaining good results from the double sulphate of nickel and ammonium solution, it was not until about 1870 that it came into commercial use. In the early days of the electro-deposition of nickel the failure of obtaining a successful deposit lay to the fact that it was impossible to obtain the salts of nickel in a perfectly pure state. Each plater or rather those that found use for the solution took the metal and dissolved it in nitric acid, precipitated the nitrate with carbonate of soda and dissolved the carbonate of nickel in sulphuric acid to obtain the sulphate of nickel. Here is where the fault in obtaining the pure salts of nickel was found to be. No one thought of thoroughly washing the carbonate of nickel until it was free from the sodium nitrate.

The successful application of nickel plating is due to Mr. Adams. He began a thorough study of the failure of nickel plating and found it to be due to the presence of nitrates in the salts. In 1869 he obtained a patent by which the impurities were removed and while improvements have been made by the addition of conducting salts and brighteners to the solution he must be given credit for placing the art upon a permanent basis.

The first requisite in preparing the nickel bath is the use of absolutely pure chemicals, whether the chloride, the sulphate or the double sulphate of nickel and ammonium, the choice depending upon metal to be plated.

The solution usually employed in preparing the solution is the double sulphate of nickel and ammonium, a crystalline salt of a beautiful emerald green color. Many solutions have been proposed but for all practical purposes a solution of the double sulphate of nickel and ammonium with the addition of a little sodium or ammonium chloride is the easiest to work and the most uniform in results if care is taken to prevent the introduction of foreign materials. Twelve ounces of this salt dissolved in one gallon of water with the addition of one ounce of ammonium or sodium

chloride are the proportions usually employed. It will not take up much more of the double nickel salts unless used hot and will readily crystallize out of solution with a drop in temperature as the double salts are only soluble 3.2 parts to 100 parts of water (4.1 ounces to a gallon) at 50 F.

While this solution is used with good results it can certainly be improved upon. A solution made from the double nickel salts only is a neutral bath. As it is desirable to have the bath slightly acid, with few exceptions, the addition of some single salts, which is an acid salt, gives the desired results, and as the single salts are more soluble, 37.4 parts to 100 parts of water (3 pd. to a gallon), at 50 F., than the double salts, the bath is capable of holding in solution a greater amount of metal, thereby decreasing the resistance of the bath and aiding a more rapid deposit.

Boric acid when added to the solution gives a white and tougher deposit and a more brilliant luster can be obtained under the buff. For articles to be plated that have a background where the whiteness of the deposit is to show to advantage it is an excellent addition agent.

To decrease the resistance of the solution conducting salts are added, and to be of any success these conducting salts must be partly decomposed by the current. A great many have been recommended, such as ammonium chloride, sodium chloride, potassium chloride, magnesium sulphate and ammonium sulphate, but the best results are obtained from the use of ammonium or sodium chloride. It is a difference of opinion as to which is the best, as each has its merits. When either is present in a nickel bath during electrolysis, chlorine is evolved at the anode and this attacks the anode, forms a more perfect corrosion, causing the anode to dissolve more freely and aiding the bath to maintain its proper acidity.

The conductivity of ammonium chloride is greater than that of sodium chloride and an excess can be readily overcome by the use of a little sulphuric acid, which is not the case with sodium chloride. By using sodium chloride another element is introduced in the bath, but it is used quite extensively on account of its cheapness.

Magnesium sulphate is used by some platers, but as the deposit has a slight yellow tinge when this salt is used, it is not to be recommended where the whiteness of the deposit is to be considered.

A solution composd of the following will be found to give excellent results for the ordinary run of work:

Double nickel salts	8 oz.
Single nickel salts	2 oz.
Ammonium chloride	1 oz.
Boric acid	1 oz.
Water	1 gal.

This solution contains 1.6 oz. metallic nickel per gallon, is slightly acid to test and if worked with a current density of 2 volts from the tank will be found to give an excellent white deposit with a very high color when buffed.

Corrections for the Nickel Bath.

For acidity, ammonia is generally used, but this should never be added when the solution is low in metal. Carbonate of nickel if added will neutralize the acid and also add metal to the solution.

For alkalinity, sulphuric acid is commonly used, but this is also wrong if the bath needs metal. Nickel sulphate should be used. The acid part of the salt neutralizes the alkalinity of the solution and the metal part of the salt gives new life to the bath.

To replenish the bath, do not use the double salts alone. Add both double and single salts in the proportions given in the formula if the acidity of the bath is correct. If too acid, use more of the double salts, if too alkaline, more of the single salts.

Analysis of the Nickel Solution.

This may be accomplished in one of three different ways, namely: gravimetric, volumetric or electrolytic. The gravimetric method consists of precipitating the metal from solution, filtering, washing and ignition of the precipitate and calculating the precent as nickel oxide. The volumetric method consists of titrating a definite volume of the solution with a standard solution, sufficient being used to cause complete reaction. The electrolytic method consists of determining the quantity of metal in the solution with the aid of the electric current and weighing. Of the three different methods the volumetric is considered the most convenient to use on account of its simplicity and consequently less chance for error in the final results.

There are several different volumetric methods, but the best is that by Moore, which is based on the fact that if to an ammoniacal solution of nickel containing silver iodide in suspension (silver iodide being almost insoluble in weak ammonia) there is added potassium cyanide, the solution will remain turbid so long as all the nickel is not converted into the double cyanide of nickel and potassium, the slightest excess of cyanide being indicated by the clearing up of the liquid, and furthermore, this excess may be exactly determined by adding a solution of silver until the turbidity is reproduced.

The chemicals necessary for this method are: Standard solution silver nitrate, 17 gms. per L. of water; potassium iodide solution, 10%; potassium cyanide solution, 13 gms. per L. of water.

First, accurately establish the relation of the cyanide solution to the silver nitrate solution. Fill two separate 50 c. c. burettes, one with the silver solution, the other with the cyanide solution. See that they are exactly at the zero level. Deliver into a beaker the cyanide solution. Place the beaker containing the cyanide solution under the burette containing the silver solution and run in carefully, with constant stirring the silver solution until a permanent turbidity is produced. This is the end point indicating that the proper amount of silver solution has been used to combine with the cyanide forming the double cyanide of silver and potassium.

Ag No. 3—2 KCN—K Ag (C N) 2—K No. 3. (1)

If the slightest amount over and above the quantity required to form this combination be added, a permanent precipitate of

silver cyanide is produced, the double compound being destroyed.

Ag No. 3—K C N—Ag C N—K No. 3 (2)

From equation (1) it will seem that 170 parts of silver nitrate react with 130 parts of potassium cyanide to form the double compound of silver and potassium; therefore, if the potassium cyanide is of 100% purity 50 c. c. of the silver nitrate solution will exactly react with 50 c. c. of the potassium cyanide solution. As this is extremely doubtful we will say that 48 c. c. of silver nitrate solution were used instead of 50 c. c. Then the potassium cyanide would be of 96% purity. Calculated from simple proposition we have

$$50 : \underset{x}{48} : \underset{96}{100} : x$$

Having ascertained the strength of the cyanide solution, proceed as follows:

Take 10 c. c. of the nickel solution, place in a beaker, add 25 c. c. of water, 10 c. c. of ammonia and 5 c. c. of the potassium iodide solution. Fill two 50 c. c. burettes, one with silver nitrate solution, the other with the cyanide solution. Now run into the beaker 2 c. c. of silver solution. This combines with the potassium iodide, forming silver iodide and causing the solution to become turbid. Now add the standard cyanide solution with constant stirring until the solution becomes perfectly clear. The nickel has now become converted into the double cyanide of nickel and potassium.

Ni SO 4—4 K C N—Ni (C N) 2, 2 K C N—K2 S O 4 (3)

Take the readings of both burettes and correct the volume of the cyanide solution by multiplying the number of c. c. used by the percentage purity of the cyanide previously obtained. Then deduct the volume of the silver solution used from the corrected volume of the cyanide solution.

Example: Say 45 c. c. of the cyanide solution were used, there 45 c. c. x .96—43.2 c. c. corrected volume of cyanide solution, 43.2 c. c.—2 c. c.—41.2 c. c. amount of cyanide solution required to convert the nickel to the double cyanide of nickel and potassium in 10 c. c. of the nickel solution.

From equation (3) it will be seen that 59 parts of nickel re-act with 260 parts of potassium cyanide. 1 c. c. of standard cyanide solution contains .013 gms. potassium cyanide 1 c. c. of the cyanide 59 x .013 .00295 gms. of nickel.

260

41.2 c. c.—amount of cyanide used.

41.2 x .0025—.12154 gms. of nickel in 10 c. c. of the nickel solution.

10 c. c.—.12154 gms. nickel.

1 c. c.—.012154 gms. nickel.

3780 c. c.—1 gallon.

.012154 x 3780—45.942 gms. of nickel in 1 gallon.

28.35 gms.—1 oz.

45.942—28.35—1.6 oz. metallic nickel in 1 gal. of solution.

ELECTRO CLEANERS.

By Oscar E. Servis, President Chicago Branch A. E. S.

One of the greatest events in the history of electro-plating industry, and one which has revolutionized the same, was the introduction of the Electro Cleaner. When we stop and reflect in years gone by how much valuable time was consumed in cleaning the articles preparatory to plating, and the waste of energy and material that was necessary to remove the film of grease, a plater's greatest foe, I often wonder how we managed to turn out the work required and yet keep down costs in the Plating Department.

About the year 1904 Electro Cleaning first began to make its inroads on a commercial scale. Although it is true some platers had been using this method in isolated instances, but not until the time mentioned had any great interest been displayed in the process.

During the five succeeding years manufacturers began to introduce certain compounds, mostly composed of Potash-Soda Ash and mineral alkalies, claiming that by the aid of the electric current, mineral and vegetable oils and grease could be successfully removed and the surface made ready to receive the metallic deposit. During the years mentioned the trade journals contained many questions and platers were at differences as to whether the direct or reverse current was correct, some claiming the former was proper, others again advocating the latter.

Theory and practice has taught us that the greatest evolution of gas is given off at the negative pole. This gas being hydrogen in its nauseant state has the property of reducing certain oxides, is therefore of use for the removal of said oxides as well as mechanically removing greases. There being two atoms of this gas given off it follows that the work would proceed much more rapidly than if the reverse current is used. Where only one atom of oxygen is set free at the positive, and therefore the former should prove correct, although some platers use both, as the amount of current is the important factor and the voltage is governed by the resistance of the solution, it also follows that any solution that requires a high voltage has a high resistance.

Many platers insist that they must have 10 or 12 volts to obtain good results, others 6 volts, while some again use 3 or 4 volts. This should be sufficient to properly conduct the operation, providing the solution is composed of the proper chemicals and sufficient heat to permit the passage of a suitable current density at that voltage. When 10 to 12 volts are necessary, it should be taken as an indication that the solution is spent and lacks sufficient alkali or of too low a temperature. The remedy is obviously to discard the bath and prepare a new one, as it is mistaken economy to try and rejuvenate an old electric cleaning bath, as they soon become contaminated with mineral acids and metals of the lead and arsenic groups.

Any alkalic solution will make an Electro Cleaner such as caustic potash or soda, soda ash or lye with a small addition of cyanide, even water will remove grease, providing there be a voltage sufficient to force the necessary current to cause a rapid evolution of hydrogen, but the resistance of water being so high that it becomes necessary if the process is to be made practical to add a

suitable chemical which will reduce the resistance and permit a current to flow at a low voltage, one that will not be decomposed and attack the metal being cleaned, alkaline hydroxides free from sulphates chlorides and soft metals are ideal for this purpose.

My experience has been that Electro Cleaners are unnecessary for cleaning polished brass or copper, yet I know of platers who clean brass goods, that are soldered, in the Electro Cleaner, remove the grease and at the same time discolor the surface, due to the presence of the solder, and then again remove the same by the aid of the reverse current, for a few moments, and yet turn out good work.

As we use these cleaners they become greatly contaminated with soft metals such as lead, tin or zinc, mineral oils and greases, some which may contain arsenic. Polishing compounds of various kinds. Many cleaners have been tried out with more or less success. They are composed of various secret compounds and sold under high sounding names, and there is no question but that for certain purposes when new and fresh they are very satisfactory, and if they were used as the operator ordinarily uses a potash bath that is as long as it works satisfactory all would be well, but many of us seem to think because an article is sold to do electro cleaning it should continue to do this and never wear out. This belief has been one of the chief causes of dissatisfaction against Electro Cleaning compounds. This is probably due to the cloak of mystery thrown around these mixtures. The operator not knowing of what the cleaner is composed is unable to add that chemical which would rejuvenate the bath, and as a consequence when the real active element, which for argument's sake we will say is a small quantity of sodium hydroxide, becomes to the action of heat and influence of the air, converted to a mild carbonate, and has thereby deteriorated, consequently increasing the electrical resistance of the solution, and in this way automatically reduces the current density, to a point where sufficient gas is not given off to successfully clean the article. There has been many instances where this has been the case, and by an addition of ordinary lye, it is found that the cleaner will again perform its proper function.

This leads to the belief that if a small amount of lye will rejuvenate the cleaning bath, why would it not be a good policy to use this by itself and in this way eliminates much of the darkness and doubt through which the plater gropes his way when using mysterious compounds. We work it for some time, then we find that we cannot get good results any longer, due to the constant contamination, and we blame the cleaning compound. Try another until we have the same trouble as before.

Remember that the solution has only a certain amount of saponifying properties and while a great part of the greases are insoluble and must be skimmed from the surface, nevertheless a great deal of the same is taken up by the solution so that in time we have our cleaner pretty well laden with impurities, which eventually causes tarnishing and corrosion of the surface. Then again we blame the cleaning compound and denounce it, although they all have more or less merit. A reverse current may be used. But in the presence of soluble sulphates and chlorides will cause pitting,

or corrosion again. In Electro Cleaning only greases that saponify are dissolved mineral oil and sediments are forced off the work by the mechanical action of the gas and the oil rises to the surface, which should be skimmed off frequently or it will adhere to the articles as they are removed from the cleaner, and is often the cause of much peeling of the deposit through no fault of the Electro Cleaner.

As the work generally comes from the polishing room with more or less grease on the surface, a certain amount of judgment is necessary in the operation of cleaning, especially due to the various polishing compounds, such as emery cake, tripoli, and paraffine compounds which have caked and are imbedded in backgrounds or deep recesses, oftentimes it is of advantage to have an extra tank and let them soak for some time in a solution of weak lye, soda or whale oil soap, particularly when the work is delayed, and the polishing agents become dry and hard to remove, a cleaner has its limitation as well as application.

There is a method of Electro Cleaning that in my estimation surpasses all others, one which has only recently been quoted in the trade journals, still it is surprising how little it is known, or has been in use in general, that is the copper flash. The writer has used this process for about eight years, have found it economical, easy to manage and gives excellent results, providing you have sufficient current density, any imperfection of the operation on the surface of the article can be readily detected, as if for instance a spot that the copper flash has not covered, the grease is not removed, and this then tends to act as an indicator.

The solution must be worked near the boiling point. It deposits a thin film of copper not sufficient to stand wear, but insures a perfect adhesive surface for all purposes, and has the additional advantage of improving the color of the deposit, especially on nickel work which has deep backgrounds and recesses. In this cleaner the presence of soft metals, such as lead, tin and zinc, exert no harmful influence, as they are deposited with the copper in the form of brass or bronze. An iron welded tank is frequently used as the anode and should not be any larger than is absolutely necessary. This method is to be avoided if the common chloride mixture of cyanide is used in construction of the bath, then a steel anode should be suspended in the solution and insulated from the tank, together with several small copper anodes, the object in using the large steel anode in preference to copper is to prevent too heavy a current density on the copper anodes which has a tendency to cause a heavy coating, which would cause them to become heavily coated and therefore insulated from the solution. The steel anodes being practically unaffected will convey the current and in this way permit the smaller copper anodes to remain in good condition. One to two minutes' time is all that is needed to obtain a good flash and properly clean the work simultaneously, depending of course on the size and condition of the articles, and proper density of the solution. On flat called cold rolled stock on which there is but small quantities of grease it has been found that the following formula gives excellent results, with a current density of 50 to 75 amperes per square foot, at a voltage of 3½ to 4 volts. We must

bear in mind that for uniform results some system is necessary. It has been observed that when the tank is completely filled with racks that 250 amperes flows, but when only one rack is placed in the tank close to 150 amperes is used, it is manifest then that if 250 amperes is sufficient for four racks, that 150 amperes would be too much for one rack and might cause trouble, which might be avoided by a suitable rheostat in the circuit.

I have cleaned thousands of pieces per day in this solution and it has never failed me; in fact, I could not get along without it.

The tank should be provided with a suitable hood and have sufficient draught to properly remove the fumes given off during the operation, as they are very penetrating and injurious to the operator.

I prepare the solution as follows:

Lye	1 lb.
Soda Ash	2 oz.
Cyanide	1½ oz.
Carbonate of Copper	¼ oz.

If you have a copper cyanide solution at hand some of it may be used and will take the place of the carbonate, and sufficient to get a good copper flash, carbonate of copper should never be added to the solution while in operation, as the surface will then become rough and granular, it should be added after the day's work is over and the solution well stirred, the proper way of dissolving the copper carbonate is to dissolve the same in the cold cyanide solution it is a good idea to have a stock solution on hand ready to use. If carbonate of copper is dissolved in hot cyanide, the carbonate is decomposed into a brownish black compound insoluble in cyanide. This solution will be found a boon, where it is desired to prepare a surface to receive a nickel deposit on nickel.

The Combination Hot Copper Solution.

There is also another method of cleaning and obtaining a heavy deposit simultaneously. The economy of this method depends upon whether there is sufficient work to keep it busy. If so, there is no simpler nor faster method of plating that the writer is aware of. The work may be taken from the polisher, cleaned and plated at the same time, a high current density is passed through the solution sometimes as high as 150 amperes to square foot, and will deposit a coating of copper or brass in five minutes that will stand cutting down on a 12-inch buff, providing the metallic content of the solution is correct. It is simply an ordinary copper or brass solution with an addition of lye or caustic potash, added to it, with a little higher cyanide content than generally used in the cold solution, for brass the same with an addition of zinc and carbonate of ammonia. Sodium tartarate has also been recommended. In brass plating it has been found necessary to use this at the boiling point if a uniform color is to be obtained, the reason for this is that a brass solution which yields a good color at ordinary temperature when heated is very apt to deposit only copper. It being a very difficult matter to maintain a constant temperature at less than the boiling point. it will be seen that inasmuch as we can keep a solution boiling and therefore constant in temperature that this would be the proper degree of heat at which to work this bath. Any cleaner can be ruined if some judgment is not used in the operation of the same.

WHAT THE BRANCHES ARE DOING

NEW YORK BRANCH.

Meets second and fourth Friday of each month at 258 Pearl Street, New York City, 8 p. m. Secretary, Wm. Fischer, 345 East 23rd Street, New York City.

The regular monthly meeting of the New York Branch was held at their rooms on Friday evening, February 25th. Two applications for membership were received. The resignation of Dr. Weber was received and accepted with regrets.

The banquet of the New York Branch, held on Saturday evening, February 19th, was a great social and financial success. There were over two hundred present, and the New York Branch wishes to thank all who helped to make it a success. The laboratory committee are preparing a demonstration on all the different kinds of nickel solutions and an interesting discussion is expected at our next meeting, the second Friday in March.

The seventh annual banquet, recently held at the Broadway Central Hotel, was a very successful affair. The guests were much interested in the display of finishes shown by the members, also in the display of chemicals and plating apparatus and lacquer spraying equipment displayed by several concerns. The menu provided for was enjoyed by all, and a spirit of congeniality and friendship prevailed; after dinner the cigars and refreshments were indulged in. The toastmaster, Mr. Edward Faint, president of the Newark Branch, welcomed the members and guests with an interesting talk on the progress of the society, and introduced the several speakers, Dr. Blum, of the Government Bureau of Standards, being first. Dr. Blum gave a history of the work of the Bureau of Standards and the results accomplished and its connection with the electro-deposition of metals. It has standardized the solution used for the deposition of copper on electrotypes for printing, and the exhibits shown of deposits produced under various conditions, such as density of solution, current density, temperature, and amount of free acid were both instructive and interesting to the plater. He stated that the benefit to be derived from the Bureau of Standards by the plating fraternity would depend upon the co-operation of electro-platers' societies with the Bureau, which is anxious to take up any work which will be of any benefit to the industries of the country. Dr. Blum was warmly applauded.

Our old friend Dr. App Jones was next introduced. Dr. Jones needs little introduction to the New York Plating Fraternity; he gave us an interesting talk on the chemical situation in this country at the present time, due to the European disturbance, and also what it is likely to be in the future. Dr. Jones was followed by Dr. Lukens, who gave a very interesting description of the methods he uses in determining the metal contents of a plating bath. Dr. Stanley followed Dr. Lukens with a short talk on the close relationship which should exist between the practical plater and the electrochemist. The toastmaster thanked all for their attention to the speakers, and everybody sang America.

DAYTON BRANCH.

Meets first Wednesday of each month at the Y. M. C. A., Dayton, Ohio, Secretary, Alphonz Lamourcux, 500 East First Street, Dayton, Ohio.

The meeting of the Dayton Branch on the first of March was a very interesting one. Mr. O. Rodgers, head of the Electrical Department of the N. C. R. Co., gave an illustrated lecture on the principle of the modern dynamo, illustrating by means of charts the difference between the several types and their method of construction. He demonstrated clearly the causes which tend to develop trouble in the generator and the remedy for them. Mr. Rodgers will give another lecture later in the year on the Modern Power Plant and Power Switch Board. I send you this in case our secretary fails to make the usual report.

CLEVELAND BRANCH.

Meets once a month at American House.
Secretary: CHARLES WERFT, 331 Strathmore Avenue, Cleveland.

The last meeting of the Cleveland Branch, held Saturday night, February 26th. at the American House, was well attended, notwithstanding the blizzard that raged all day and night.

Mr. Randall, acting for the Commercial High School, offered the Cleveland Branch the use of their laboratory and instructor.

The Cleveland Branch was the recipient of the book form of The Metal Industry for 1915 from the Metal Industry, and a note of thanks was sent to them.

CHICAGO.

Meets fourth Saturday of each month, 8 p. m., Western Building, Randolph Street and Michigan Avenue. Secretary, H. E. Willmore, 5911 South Boulevard, Chicago, Ill.

The regular monthly meeting was held Saturday, February 26th, at which a good percentage of members were present.

Mr. Louis Schulte, Chairman of the Educational Committee, gave an extended report of his negotiations with the members of the Chicago Board of Education relative to the formation of a class in chemistry and gave as his opinion that nothing could be done in this respect until next September. It was then suggested that each member subscribe to the fitting up of a laboratory and qualified members act as instructors. The matter was thoroughly discussed from all angles and it is expected that before long a suitable room will be engaged and work along these lines commenced.

A bound volume of the Metal Industry has been received from the publishers, for which thanks are extended.

ST. LOUIS BRANCH.

Meets fourth Saturday of each month at Public Library Assembly Rooms. Secretary, F. C. Rushton, 4405 Blair Avenue, St. Louis, Mo.

The regular meeting was held on February 26th. The banquet committee made their final report, and one application was

received. The secretary was instructed to send a letter of appreciation to The Metal Industry for bound volume of 1915.

The greater part of the evening was spent discussing general plating subjects and was very interesting.

Since our meeting we have lost one of our members by death, Mr. H. T. Healy, who will be missed by us, as he attended our meetings regularly and took an active part.

PHILADELPHIA BRANCH.

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, Philip Uhl, 2432 North Twenty-ninth Street, Philadelphia.

The regular monthly meeting of Philadelphia Branch was held March 3rd. Owing to the absence of President Samuel Barr, Vice-President W. J. Bell occupied the chair.

Owing to the inclemency of the weather, there were only a few members present, who passed the time in discussing the details of our visit to the New York banquet. Twelve members of this Branch took the trip. Mr. J. L. Dinan met us in New York and took us on a tour, visiting some of the plating plants in New York and Newark. We were cordially received by Dr. Jones and were shown some fine specimens of lacquer work. We enjoyed the trip immensely and are looking forward to the next one. A vote of thanks was given to the Metal Industry for the bound volume of the 1915 issues.

INDIANAPOLIS BRANCH.

Meets second Saturday of each month at Hotel Dennison. Secretary, Louis Mertz, 1725 Union Street, Indianapolis, Ind.

An open meeting and smoker was held on Saturday evening, March 11th, in the Press Club Rooms of Claypool Hotel which was not only a success in itself, but will result in more activity among the members of our branch. We were honored in having among our speakers and guests, our Supreme Secretary-Treasurer Walter Fraine and Past Presidents Proctor and Hansjosten; also E. A. Lamoureux of Chicago. Mr. Wright and E. S. Thompson of Muncie and A. C. Hoffman of the Technical High School of Indianapolis.

TORONTO BRANCH.

Meets fourth Tuesday of each month at Occident Hall, Bathurst and Queen Streets. Secretary, Ernest Coles, P. O. Box 5, Coleman P. O., Toronto, Ont.

The regular monthly meeting of Toronto Branch was held on Thursday, February 25th, and proved to be quite up to standard, President Salmon presiding over an excellent attendance of members, with "interest" as the most noticeable feature. The result of the referendum vote on the assistant foreman amendment came in for considerable discussion and it was decided that, although Toronto Branch voted for the adoption of it, in view of the closeness of the vote nothing should be done in the matter of electing assistant foremen to membership until after the next convention.

President Salmon announced that a bound volume of the Metal Industry, 1915, had been presented to the Branch by the publishers and a unanimous vote of thanks and appreciation was accorded to them for their kindness. A general discussion on various "platers' problems," in which all members took part, brought the meeting to a successful close.

Queer, ain't it, how noticeable the absence of one members is. Everybody's hoping that "down south climate" works wonders and does it quick.

NEWARK BRANCH.

Meets first and third Friday of each month, 8 p. m., 47 Bank Street, Newark, N. J. Secretary, Geo. Rutler, Jr., 333 S. 19th Street, Newark, N. J.

The members of the Newark Branch of the American Electroplaters' Society on Saturday evening, February 26, 1916, entertained their wives and friends at their laboratory, located at No. 49 Bank Street, that city.

About seventy-five persons were present, including several members of New York Branch. President Edward W. S. Faint welcomed the guests in his customary good spirit. Miss Ruth Adams, an accomplished elocutionist from Hartford, Conn., rendered several interesting and entertaining selections. Mr. Walter Birch, a pianist of Newark, also contributed to the evening's pleasure and his efforts were much appreciated.

A game of "bean bag" proved of considerable interest to the guests, who endeavored to excel each other with a view of becoming recipients of two umbrellas offered as a reward to the lady and gentleman who acquired the highest score. Refreshments were served and Victrola selections were enjoyed. Dancing was indulged in until long after the guests were willing to concede that the Sabbath had arrived. This social function was the first of its kind held by the Newark Branch at its laboratory and the participants expressed considerable regret when the lights were dimmed.

BRIDGEPORT.

Meets third Friday of each month at the office of the Brass World, 260 John Street, Bridgeport, Conn. Secretary, Nelson Barnard, 858 Howard Ave., Bridgeport, Conn.

DETROIT.

Meets first Tuesday of each month at 26 East Congress Street. Secretary, B. E. Miller, 543 Townsend Avenue, Detroit, Mich.

MILWAUKEE.

Meets first Friday of each month at West Side Bank Building, Third and Chestnut Streets. Secretary, E. C. Yaeger, 962 Ninth Street, Milwaukee, Wis.

CINCINNATI.

Meets once each month at Dennison Hotel, Cincinnati, Ohio. Secretary, F. H. Nordmann, 720 Froom Ave., Cincinnati, Ohio.

TOLEDO.

Meets the last Tuesday of each month at Toledo University. Secretary, James E. Nagle, 209 Navarre Ave., Toledo, Ohio.

ROCHESTER.

Meets second and fourth Friday of each month at University of Rochester. Secretary, C. V. Haring, 603 Dewey Avenue, Rochester, N. Y.

BUFFALO.

Meets first Saturday of each month at the University of Buffalo, 8 p. m. Secretary, John G. Murphy, 71 Dingens St., Buffalo, N. Y.

APPLICATIONS FOR MEMBERSHIP.

Toronto Branch.

Mr. Roy Williams (associate)..... 478 Roncesvalles Ave.
Mr. Albert T. Davey..... 451 Montrose Ave.

Chicago Branch.

Mr. Frank Pankan..... 4111 Dickens Ave., Chicago
Mr. Herman Hoenchied..... Peru, Ill.
Mr. Robert Meyers..... 1116 Sill Ave., Chicago

Milwaukee Branch.

Mr. Stephen Verfurth..... 1336 Richards St.

Indianapolis Branch.

Mr. Wm. Wright..... 507 Riverside Ave., Muncie, Ind.
Mr. Gus. J. Soechle..... 628 Noble St., Indianapolis

St. Louis Branch.

Mr. Geo. Marsh..... Belleville, Ill.

New York Branch.

Mr. Frederick Hauschalter..... 82 Hull St., Brooklyn, N. Y.
Mr. Leo P. McDermott..... 20 Hinman St., Meridan, Conn.

ELECTED TO MEMBERSHIP.

Toronto Branch.

Mr. James Vallier..... 701 Crawford St., Toronto, Ont.

Philadelphia Branch.

Mr. Harry B. Farrand..... Sellersville, Pa.

Chicago Branch.

Mr. Edward S. Hommedieu..... 26 S. Clinton St., Chicago

Indianapolis Branch.

Mr. Geo. S. Martin..... 1805 Fairview St., Anderson, Ind.
Prof. A. C. Hoffman (honorary).
Technical High School, Indianapolis, Ind.

New York Branch.

Mr. Julius Erdies (associate)..... 1000 Brook Ave., New York
Mr. Frank Loeb..... 128 McComb Place, Glendale, L. I.

Newark Branch.

W. L. Bedell..... 385 Ridge St., Newark, N. J.

Detroit Branch.

William W. Beam..... 825 Elizabeth St., Flint, Mich.

A HYPOTHETICAL DAY.

By H. J. RICHARDS.

A plater woke up on a bright, sunny day,
Feeling elated and happy and gay;
To his business he went with a heart full of joy,
With a step just as light as a 10-year-old boy.
The main boss came to him, and said with a smile,
"I have good news to tell you, just listen awhile:
All this nickel plating you turn out, my son,
Is the best nickel plating that ever was done;
Our customers say that our goods never rust,
And that work plated here they can certainly trust;
If it stays in the weather all day and all night
For a year and a half, why that plating stays bright.
I just can't help giving you these words of praise,
And you soon will be getting a nice, juicy raise."
A polisher stopped him, and said with a smirk:
"This shop it is surely a good place to work;
Those castings we're getting are certainly nifty,
You can rough them right out on a hundred and fifty;
And that glue we're using we surely can praise,
When I set up a wheel it will last for eight days."
Then one of the buffers stepped up, and said he:
"Those buffs are the best that I ever did see;
Every section is balanced, I think that's essential,
They run just as smooth as a Ford differential;
And the plating turned out it is certainly slick,
It is easily buffed, though the nickel is thick;
Those plating room helpers have certainly learnt
We never, no never, get work that is burnt."
His plating assistant came to him and said:
"Those tanks work so fast they can hardly be fed,
The solutions plate fine and exceed all speed limits;
Work that once took ten hours now takes twenty-five minutes."
I've no doubt you're wondering if this can be true,
And if all of these good things can happen to you.
But the reason and reasons for this guy's success
Was because he belonged to the great A. E. S.
Which stands, as you know, for those great educators,
The American Society of Electro-Platers.
They're a bunch of progressives in word, thought and deed,
And the man that progresses is bound to succeed.
For knowledge that's buried and hidden from sight
Is found of small value when brought to the light.
That the golden rule profits, I firmly believe,
For as you give, so shall you also receive.